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ABSTRACT

This paper discusses some of the potential benefits and hazards that virtual reality holds for exceptional children in the special education system. Topics addressed include (1) applications of virtual reality, including developing academic skills via cyberspace, vocational training, and social learning in cyberspace; (2) telepresence and distance education; (3) the role of teacher in cyberspace; (4) changing teacher-training programs; (5) the corollary curricular change; and (6) the risks of using virtual reality in special education. Although virtual reality is in its infancy, a theoretical framework must be developed that will guide its use. (Contains 10 references.) (SLD)

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ED 363 321

Special Experiences for Exceptional Students: Integrating Virtual Reality into Special Education Classrooms

by
Erez Cedric Miller

Introduction

Classroom. The walls are covered with posters, pictures and bulletin boards. Eight students are sitting on their chairs. Some of them are gazing at the teacher. Others look as if they are concentrated in a world of their own. Two of the students are sitting in wheel chairs.

"Students", the teacher announces, "today we are going to visit a forest. I want everybody to put his or her eye goggles on, and I am going to help you to connect your data suits to the computer."

The teacher then helps those who need some help to put their equipment on... In a blink of an eye, the scene changes. They are all in a big forest, surrounded by green trees, bushes, wild berries and birds. "Now, let us get closer to see the leaf over there." One by one the students fly up, until they all end up on a huge leaf...

None of the students has ever left the classroom during the trip to the forest. Yet they all learned and experienced leaves that have different shapes, how they grow and shrivel, and how they change their colors in the fall. The entire scene took place in *cyberspace*. Will such a scene actually take place in the learning environments of special education classrooms of the twenty-first century?

The purpose of this paper is to discuss some of the potential benefits and hazards that virtual reality holds for exceptional children in the special education system. *Virtual reality* is a computer-created environment that replaces the normal sensorial input received by its user. Helsel (1992) adds that "Virtual reality requires hardware and software that furnish a sense of: (1) Inclusion...(2) Navigation, and (3) Manipulation." (P. 39).

While *virtual reality* refers to the technology, *Cyberspace* is the actual place where the interface between the human nervous system and the computer's computation and communication systems takes place. It is a place that takes no space in our physical reality.

Before we start, however, we must consider several issues that pertain to special education. First, special edu-

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cation is defined in this paper as consisting of various student population with a wide range of abilities and difficulties. Some of the students are sensorially challenged (e.g., blind) and\or motorically challenged (e.g., children with Cerebral Palsy), while others are mentally retarded, behaviorally or emotionally disturbed. Students can also have one or more of the above conditions concomitantly. Consequently, each student must have his own individual educational program, tailored to his specific needs and abilities.

Why virtual reality?

Many teachers in special education describe their students as lacking experiential background. The experiential deprivation can be caused by sensory deprivation (blindness, deafness), by physical immobility, by communicative difficulties or by many other conditions that restrict the exceptional child's repertoire of experiences. The experiential deprivation further leads to academic and social deficits.

Cyberspace is the ultimate experience as we conceive it today. It is a world in which pure information will be heard, felt, smelled and, of course, visualized. Thus, it is especially appropriate for experiential learning.

Increasingly, research findings report that experiential learning is more effective and is retained by the students for a longer time. Lowenbrow and Barbee (1990) suggested that intelligence and expertise must interact with the environment; that individual learner characteristics must be considered when constructing a learning environment; and that learning must be embedded in a meaningful context. They also suggest that the transference of the acquired skills and knowledge is more likely to happen if learning took place in a meaningful environment. One cannot overemphasize the importance of contextual embedding to special education. Abstract reasoning and symbolic representations are often too difficult for exceptional students to perceive, acquire, retain and transfer. By developing new theories and implementations, we can increase the effectiveness of special education.

Developing academic skills via cyberspace

Some students in special education, for example, encounter great difficulty in trying to understanding the *symbolic representations* of objects and processes. Difficulties can also arise when these students try to read texts (which are printed symbols). Teachers can use cyberspace as a means to guide the child to various sources of information. This information will be presented in the most appropriate media to the child's understanding, mode of communication and sensory perception. The multisensorial experience in the forest that we illustrated earlier, will to be more effective for their learning than presenting pictures or verbal explanation about the leaves. In virtual reality objects can be maximized if their real-life size is too small (e.g., living cells) or minimized if they are too big (e.g., skyscrapers). Processes, such as the leaves changing their colors in the fall, or the development of planets or the growth of plants can be catalyzed so the students will be able to watch the process taking place in

front of their eyes. Fast processes or movements such as the bee's flight, can be decelerated to a speed that can be perceived by the child.

In a history class, for instance, instead of *talking* about ancient Egypt, showing pictures or even films, the teacher can take the student on a trip to a virtual ancient Egypt. Suddenly, the abstract stories about the pyramids will be visualized, and the magnificence of the Sphinx will be perceived with full appreciation. Stories and literature can be played by virtual actors, and students will actually be able to take part in the poems and stories they study. Subject matters which today are beyond the reach of exceptional students because of their abstract nature, will be perceived and experienced in cyberspace.

Those exceptional students who experience their learning through the multisensory media of cyberspace are likely to retain their experiences for a longer time. They will also be able to transfer the knowledge they acquired to novel situations. If 'knowing' will be directly connected to 'doing' and 'experiencing', as Lowenbrow and Barbee (1990) suggest, "Schools...(will) need to change what, how, when and who they teach" (Lowenbrow & Barbee, 1990, p.3). Later we will discuss the required changes in the curriculum that will have to take place if we integrate virtual reality into our special education classrooms.

Vocational training

Special education at the high school level is often geared toward vocational training. Virtual reality can provide an excellent medium for training the student in a secure environment. When training mentally retarded students, for instance, the learning process must be turned into an *active* one. Fritz (1991) asserts that for both adults and children virtual reality could help make information more concrete by linking abstract ideas to tangible physical objects or symbols. Two advantages jump to mind when we consider incorporating virtual reality into training sessions. First, instead of buying expensive machinery, the trainer could reconstruct a virtual machine in cyberspace that will simulate the real machine, and save the school a significant amount of money. Second, some machines in the physical world can be hazardous if their operator is not fully skilled, hence these machines cannot be used in the training process itself. Virtual reality can compensate for this drawback, as the student can practice operating the virtual machine again and again without being in danger. Even the most fatal mistakes can be corrected and reconstructed repeatedly, until the student has fully mastered the required operational skills.

Social learning in cyberspace

Previously we discussed the promise that virtual reality holds for developing the academic abilities and vocational skills of exceptional students. Yet many of these students also encounter serious difficulties in the social domain. In the past researchers and teachers tried to train the child in those skills he or she is lacking. Often they reported that transference to novel situations outside the classroom was only partial, if it occurred at all.

Transference of acquired social skills to novel situations is hampered because the classroom environment does not successfully emulate real-life social problems.

The idea of mainstreaming exceptional children into regular public schools originated in social learning theory. The idea was that if exceptional students were exposed to and interacted with "normal" students, they would imitate their peers' social behaviors. Today the educational system has slowly begun to sober from this euphoristic vision. Often, even if the exceptional child was academically successful, he remained socially isolated, as happened in the many cases of deaf and hard of hearing students over the past 15 years. In cyberspace, social skills and behaviors, as well as whole virtual social situations, could be practiced within the secure boundaries of cyberspace. What is required is to construct simulated social situations in which the student will interact with cyberpsychically digital life forms.

The new forms that society, culture and socially consensual behavior will take in cyberspace lead us to reexamine our current social and cultural framework. Stone (1991) discusses "social spaces in which people will still meet face-to-face, but under new definitions of both "meet" and "face". These new spaces instantiate the collapse of the boundaries between the social and technological, biology and machine, natural and artificial that are part of the postmodern imaginary." (p. 85).

Before we start teaching our students the codes of society and culture, we must ask ourselves which codes of what culture do we wish to teach - the cyberspatial or the 'real' one. This question must be addressed before we attempt to experiment with students who will a need highly constructed and consistent environment.

Telepresence and distance education

With the introduction of telecommunication and telepresence, schools will have to reconstruct their conception of the traditional classroom structure. After all, there is no necessity that all the students in the virtual classroom will occupy the physical space. This situation will enable a student who resides in remote places to receive education from highly qualified teachers and experts without having to travel great distances at great expense. We must also remember that school personnel in special education do not merely consist of teachers. Physicians, neurologists, speech therapists and other professionals provide services to exceptional students as well. Through telepresence and highly sophisticated data suits, experts from all parts of the world will be able to provide services to students in remote places.

The role of teacher in cyberspace

When computers were first introduced to schools in the early eighties, many believed that computers would rapidly replace the teacher's role in the classroom. Those who held the view of computers as the ultimate tutoring agents have since sobered. The teacher had, and will continue to have, a significant role in the student's learning environment. However, the

traditional role of the teacher will have to change dramatically. Instead of being the sole or major source of information and its representation, "the teacher will inspire, motivate and serve as referee for the human-to-human discussions that computerized instruction is designed to evoke" (Lemonick, 1992). Education, rather than being unidirectional, will evolve to be a reciprocal process. The teacher will become a facilitator, a guide, rather than keep his traditional role as an "instructor".

Changing teacher-training programs

One, obviously, cannot anticipate a drastic change in the traditional teacher's role without a preceding radical change in teacher-training programs. There are two fundamental issues that we must conceive before this change begins. The first is the role of the teacher as a *facilitator*. Rather than focusing on learning *how to teach* subject matters, teacher trainees will focus on *how to construct* experiential learning environments, by using advanced technology. The second issue is directly linked to the first one. Until today, many teacher trainees have hardly any hands-on experience with existent technologies such as multimedia and computer networks - not to mention virtual reality. Greater accessibility to technology will not suffice, naturally. Courses in 3-D graphic design and cyberspatial architecture will have to augment the teacher training program to enable the trainees to experience and learn how to construct virtual learning environments.

The corollary curricular change

Not only the teacher's role and the teacher's training will have to change conceptually before we integrate virtual reality into our classrooms. We must also shift our focus from *teaching* to *learning*. Learning in the sense of controlling one's environment, of learning *how* to learn. Learning in the sense of knowing how to *gather* and *sort* information, how to navigate through the ever-accumulating sea of information. "Knowledge navigation", which was coined by James Dezell, president of EduQuest (a division of IBM) appears to be the appropriate term for that type of learning.

Virtual reality can be a highly distractive environment for certain students in special education due to its multisensorial nature. Thus, learning environments must be designed in such a way that the attractive nature of virtual reality will not turn to be distractive. The laws of physics and spectrum of colors should strictly emulate those of the "physical world", in order not to further confuse the student. If a certain autistic child is sensitive to light or certain sounds, this child's cyberspace and equipment must be modified and constructed according to the child's special needs.

Another question we should raise concerns the *educational nature* of the cyberspatial learning environment. We must carefully examine if it is truly educational in essence, or just an attractive game for the child to play. Trotter (1991) raises the question of the *effectiveness* and the *educational nature* of some of the educational software packages that currently exist

in the market. It is the special educator's duty to step forward and guide cyberspace architects in their work, so that the outcome will be appropriate for his/her students' needs and abilities. Although many will be quick to dismiss the teacher when introducing virtual reality, our earlier discussion demonstrates the significant role that teachers will play in future educational systems.

> "The new education must teach the individual how to *classify* and *reclassify* information, how to evaluate its veracity, how to change categories when necessary...how to teach oneself. Tomorrow's illiterate will not be the man who can't read; he will be the man who has not learned *how to learn*". (Toffler, 1970, p. 414).

These words of Herbert Gerjuoy's were cited more than 20 years ago by Alvin Toffler in his book "future shock". Has the educational system changed since? Indeed it has. The educational system is slowly turning to experiential learning. Yet schools still have a long way to go until we will keep up with Gerjuoy's vision of future education.

Sandra Helsel (1992) points out two important changes that virtual reality is likely to create in the educative process. The first is the shift from learning through *printed symbols* to learning via *simulations*. The impact of this change on students in special education will be even greater than in regular education, as many students have difficulty with printed symbols of age-appropriate texts. Hence, the exceptional student's accessibility to many sources of information currently available to his regular peers, is limited. The second change in the educative process is the change in curriculum materials from text-based to imagery and symbol based. How will those exceptional students who stumble over printed texts learn via symbols? How will exceptional students who find the abstract verbal communication difficult communicate in cyberspace? Will they find it easier to communicate their ideas and learning process via visual, tactile, auditory or olfactory means rather than the abstract verbal form of language? These questions are left to be answered by researchers in the field of education and psycholinguistics.

The first step, however, is to conceive the theoretical agenda for a virtual reality curriculum. Currently, such an agenda is not even framed, as Helsel (1992) correctly points out.

Another issue that needs to be addressed is the training and the composition of the groups that will construct the virtual learning environments. Benedikt (1991) called these people "Cyberspace architects". This group should include not only teachers and education specialists, but also artists, historians, graphic designers, neurologists, anthropologists and others.

The risks of using virtual reality in special education

Virtual reality holds great promise for education in general and special education in particular. However, we must first address some intrinsic as-

pects of experiences in cyberspace, that can pose risks to exceptional students.

First, what form will the student take in cyberspace? Will he\she take the form of a "prepackaged body form complete with voice, touch and behavior", as Stone (1991 p. 85) suggests? *External appearance* can be reconstructed in a relatively simple way. But what about the behavior, patterns of thought and personality? Let us assume that we can reconstruct a personality according to a menu that allows us to choose from a variety of "personality-options" or specific characteristics. The student, then, will be able to select, for instance, the personality of an historical dictator. Whenever the students will experience a situation in cyberspace while he is using his borrowed personality, the computer will offer him several alternatives. The computer will also mark the option that most likely would have been chosen by a person with that type of personality. The process that actors are going through when they play a role will be, in comparison, a poor imitation. Such an experience might be extremely harmful to students with personality and emotional problems. Even if the student *does* retain his own personality, what effect will the experiences in cyberspace have on him/her as a person? We must answer these questions *before* we let the student engage in a process that still has an unknown outcome.

If a physically disabled child will not be bound to his physical body in cyberspace anymore, why would he/she want to return to the *physical* reality, where mobility is a constant struggle? This question also pertains to regular students who will find the physical reality rather dull and disappointing after experiencing cyberspace.

Although the current technology and graphic resolution in cyberspace are still in their infancy, many predict that technology will evolve to the point where

> "Perception would change, and with it the sense of reality, of time, of life and death".
> (Stenger, p. 50).

Current flight simulators can quite accurately emulate real flight. However, we still *know* that we are in a simulator, because we remember that we entered through the door. But what if cyberspace could perfectly emulate our physical reality? How will we be able to differ between what our senses perceive within cyberspace, and what we sense and experience outside it? If we do not wish to shatter the already frail sense of reality of an autistic child or a severely mentally retarded student, we must think twice before we allow them to experience virtual reality.

Accidents or even death in cyberspace do not hamper the physical body of the child. The student would remain intact in the physical world. We all remember watching cartoon figures being run over by a car, and then inflating themselves back to life. If children may try sometimes to imitate animated two-dimensional figures, what will be the impact of 3-D simulations? We must bear in mind that this situation, which could hamper any person's judgment, might be especially

detrimental to exceptional children. It can degrade their sense of self responsibility to their *physical* health. A possible solution was suggested by Heim (1991, p. 59): "Should causality underpin the cyber world so that an injury inflicted on the user's cyber body likewise somehow damages the user's physical body?" Maintaining the principle of causality as suggested by Heim will minimize the damages that can be caused by carelessness in the physical world.

Conclusion

Virtual reality holds a great promise for a revolution in the theory and practice of special education. Although the conceptual aspects and the technology of virtual reality are still in their infancy, their development is destined to dramatically change many aspects of our life, sociey and culture. Education is only one of the domains that can benefit greatly from this theoretical and technological evolvement. Virtual reality will open new opportunities for exceptional students to experience learning with all the senses that they have. Yet before we begin to change anything within the classroom, we must first develop the theoretical framework that is currently lacking. Changes in the curricular design and in teacher training programs will have to follow, and only finally we should try to implement our knowledge to the field of special education. The risks must be weighed against the gains, and not all the children will be able to safely learn through the cyberspatial medium.

One final thought -- it will take many years until the theoretical and technological developments will be able to produce the effects illustrated at the beginning of this article. Thus, it is reasonable to postulate that by the time Virtual Reality will be so advanced, medicine, genetic engineering and psychology will develop to the point that we will no longer need special education at all.

References

1) Benedikt, M. (Ed.) (1991). Cyberspace: First steps. Cambridge, Massachusetts: The MIT Press.

2)Fritz, M. (1991). The world of virtual reality. Training, February , 45-49.

3) Heim, M. (1991). The erotic ontology of cyberspace. In M. Benedikt (Ed.) Cyberspace: First steps. Cambridge, Massachusetts: The MIT Press.

4) Helsel, S. (1992). Virtual reality and education. *Educational Technology, May*, 38-42.

5) Lemonick, M. D. (1992). Tomorrow's lesson: Learn or perish. *Time, 140 (27)*, 59-60.

6) Lowenbrow, R. & Barbee, D. E. (1990). *The new technology: Agent of transformation*. Washington D.C.: Office of Strategic Planning and Policy Development. (ERIC Document Reproduction Service No. ED 329 248).

7) Stenger, N. (1991). Mind is a leaking rainbow. In M. Benedikt (Ed.), *Cyberspace: First steps*. Cambridge, Massachusetts: The MIT Press.

8) Stone, A. R. (1991). Will the real body please stand up?: Boundary stories about virtual cultures. In M. Benedikt (Ed.) *Cyberspace: First steps*. Cambridge, Massachusetts: The MIT Press.

9) Toffler, A. (1970). Future shock. New York: Bantam Books.
10) Trotter, A. (1991). Are today's kids having too much fun in your classroom? *The Executive Educator, 13(6)*, 20-24.

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